

PATENT

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In re application of: Davé et al.

Serial No.: 09/320,793

Examiner David M. Naff

Filed: May 27, 1999

Group Art Unit 1651

For: Environmentally Sensitive Glass
Composite Materials

Examiner David M. Naff
Assistant Commissioner for Patents
Washington, D.C. 20231

DECLARATION OF DR. BAKUL DAVÉ

I, Bakul Davé, state as follows:

1. As I stated in my previous declaration, I am an Assistant Professor of Materials Chemistry for Southern Illinois University, where my research interests include sol-gel synthesis of materials with well-defined structural, functional and operational responses. I have authored or co-authored over a dozen scientific papers and, in response to invitations, chapters of several professional scientific reference books, including articles and chapters relating to sol-gel glasses. After I received my B.Sc. degree in chemistry from Bombay University in 1987, my M.Sc. degree in inorganic chemistry from Indian Institute of Technology, Bombay in 1987, and my Ph.D. degree in inorganic chemistry from the University of Houston in 1993, I conducted postdoctoral research at UCLA in the Department of Chemistry and Biochemistry, and the Department of Materials Science and Engineering in the area of sol-gel based biomolecular materials. As a result of my educational background and my research, I am intimately familiar with sol-gel glasses and in particular what is known as "smart" materials. I am the named inventor in the subject patent application.

2. The composite materials of my subject patent application comprise a gel that is formed of an alkoxodisilane-derived matrix and water. Because of the spacer units in the alkoxodisilane-derived molecules, the interstices in the alkoxodisilane-derived matrix are large enough to hold certain desirable additives within the matrix. Moreover, the gel contains a group of alterable charge, a hydrophobic group and a hydrophilic group. As a result, the gel --and so the composite material-- responds to environmental changes of temperature, pH, solvent, salt, metal ions, chemical species, mechanical pressure, electrical potential, light, ultrasonic vibration, and so forth --that is, the gel and composite material are "smart."

3. The environmental responsiveness noted above is a characteristic of the gel itself. Therefore, for the composite materials to respond to changes in its environment --that is, to be "smart"-- the gel itself must contain the combination of groups noted above. Thus, at page 13 of my subject patent application, I refer to the formation of a "gel with a particular hydrophilic/hydrophobic composition" and to the advantages of the "presence of the amine group [(i.e., the hydrophilic groups)] in the gel . . ." The additives held within the gel are not part of the gel. Just as the fruit pieces in a gelatin mold are not a part of the gelatin itself but additives held within the gelatin, the additives within the gel of my invention are not a part of the gel itself, but are held within the gel. The gel comprises the alkoxodisilane-derived matrix and water. Because water does not correspond to any of the noted groups, the groups must be part of the alkoxodisilane-derived matrix. Thus, while the noted groups may be any part of this matrix, they still must be part of the matrix.

4. I have studied U.S. patent 5,200,334 to Dunn et al. and U.S. patent 6,080,402 to Reetz et al. Both references describe traditional sol-gels in the sense that the sol-gels described therein are not "smart" as I have described above. Thus, neither of these patents disclose or describe a structure that is "smart" in the sense I have explained above and as I have discovered results from the combination of groups discussed above. Moreover, I see no suggestion in either patent (whether viewed separately or in combination together) to employ such a combination of groups or to develop a composition that is "smart" in the sense explained above or that results from the combination of groups discussed above. Instead, the sol-gels described in the noted patents are conventional alkoxodisilane-based sol-gels.

5. The Reetz et al. patent indicates that alkoxodisilane precursors may have an alkoxy group which may be hydrophilic; however, the glass composite material of my invention, which comprises not the alkoxodisilane precursors, but derivatives of alkoxodisilane. As explained at

least twice in my subject patent application, see pages 8 and 19 thereof, conventional alkoxodisilane precursors do indeed typically contain alkoxy groups, but those groups are lost upon hydrolysis and condensation reactions to form the derivative. In other words, -Si-OR + water converts to -Si-O-Si-. Therefore, the glass composite material of Reetz et al., by contrast to that of my invention, does not contain alkoxy groups. Because the derivatives of Reetz et al. do not contain the combination of a group of alterable charge, a hydrophobic group and a hydrophilic group, they are not "smart," regardless of what additives are held in the materials described by Reetz et al.

6. I further declare that all statements herein made by my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application.



Dr. Bakul Dave

Date May. 20, 2002